

US-PAT-NO:	6466543
DOCUMENT-IDENTIFIER:	US 6466543 B1
TITLE:	Packet data sending apparatus

Abstract Text - ABTX (1):

A packet data sending apparatus controls a data transmission rate accurately at a constant level. The packet data sending apparatus has a sent data amount storage unit, a calculating unit, a selecting unit, and a packet sending unit. The sent data amount storage unit stores an amount of packet data sent from a preset time to a preceding packet sending timing. The calculating unit adds a plurality of amounts of packet data which may possibly be sent at a present packet sending timing, to the stored amount of packet data thereby to obtain a plurality of total amounts of packet data, and divides the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates. The selecting unit selects a data transmission rate closest to a desired data transmission rate from the calculated data transmission rates. The packet sending unit sends a number of packets corresponding to the amount of packet data commensurate with the selected data transmission rate.

Brief Summary Text - BSTX (14):

To achieve the above object, there is provided a packet data sending apparatus for sending a plurality of packets at each packet sending timing. The packet data sending apparatus has sent data amount storage means for storing an amount of packet data sent from a preset time to a preceding packet sending timing, calculating means for adding a plurality of amounts of packet data which may possibly be sent at a present packet sending timing, to the amount of packet data stored in the sent data amount storage means thereby to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates, selecting means for selecting a data transmission rate closest to a desired data transmission rate from the data transmission rates calculated by the calculating means, and packet sending means for sending a number of packets corresponding to the amount of packet data commensurate with the data transmission rate selected by the selecting means.

Detailed Description Text - DETX (3):

As shown in FIG. 1, the packet data sending apparatus, generally denoted by 10, comprises a sent data amount storage means 11 for storing an amount of packet data sent from a preset time to a preceding packet sending timing, a calculating means 12 for adding a plurality of amounts of packet data which may possibly be sent at a present packet sending timing, to the amount of packet data stored in the sent data amount storage means 11 thereby to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates, a selecting means 13 for selecting a data transmission rate closest to a desired data transmission rate from the data transmission rates calculated by the calculating means 12, and a packet sending means 14 for sending a number of packets corresponding to the amount of packet data commensurate with the data transmission rate selected by the selecting means 13.

Detailed Description Text - DETX (7):

The calculating means 12 then divides the calculated total amounts $(M+m.sub.0) - (M+m.sub.MAX)$ of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates $R.sub.0 - R.sub.NMAX$.

Detailed Description Text - DETX (8):

The selecting means 13 selects a data transmission rate closest to a desired data transmission rate R from the data transmission rates calculated by the calculating means 12. Based on the amount of packet data commensurate with the data transmission rate selected by the selecting means 13, the packet sending means 14 reads a corresponding amount of packet data from the storage device 20, generates packets of the read amount of packet data, and sends the generated packets to a network 30.

Detailed Description Text - DETX (13):

The packet data sending apparatus 10 comprises a data processor 10a comprising a CPU, a RAM, a ROM, and an I/O. The sent data amount storage means 11, the calculating means 12, the selecting means 13, and the packet sending means 14 are functions performed by the processing operation of the data processor 10a.

Detailed Description Text - DETX (44):

Based on the fact that the packet size is constant, the total number $M.sub.P$ of packets sent from the start time $T.sub.0$ up to the preceding packet sending timing is saved, and a data transmission rate $R.sub.N$ is calculated using the saved total number $M.sub.P$ of

packets. Since video data are sent as packets of the same size, it is not necessary to record a total amount of packet data sent in the past to each user. Rather, the data transmission rate $R_{sub.N}$ can be calculated according to the equation (2), simply by recording the number of packets sent in the past. The storage area needed can be reduced because the number of packets, rather than the total amount of packet data, is recorded therein.

Detailed Description Text - DETX (62):

The packet data sending apparatus according to a sixth embodiment comprises a plurality of parallel packet data sending apparatus according respectively to the first through fourth embodiments, and a sending process selector connected to input terminals of the parallel packet data sending apparatus. The sending process selector determines the nature of input data, selects one of the parallel packet data sending apparatus according respectively to the first through fourth embodiments depending on the determined nature of input data, and sends the input data to the selected packet data sending apparatus.

Detailed Description Text - DETX (64):

If input data is such packet data that the amount of data contained in packets is not constant and that requires an accurate packet data transmission rate in preference to high-speed packet data transmission processing, then the sending process selector sends the input data to the packet data sending apparatus according to the first embodiment.

Detailed Description Text - DETX (65):

If input data is such packet data that the amount of data contained in packets is not constant and that requires high-speed packet data transmission processing in preference to an accurate packet data transmission rate, then the sending process selector sends the input data to the packet data sending apparatus according to the second embodiment.

Detailed Description Text - DETX (66):

If input data is such packet data that the amount of data contained in packets is constant and that requires an accurate packet data transmission rate in preference to high-speed packet data transmission processing, then the sending process selector sends the input data to the packet data sending apparatus according to the third embodiment.

Detailed Description Text - DETX (67):

If input data is such packet data that the amount of data contained in packets is constant and that requires high-speed packet data transmission processing in preference to an accurate packet data transmission rate, then the sending process selector sends the input data to the packet data sending apparatus according to the fourth embodiment.

Claims Text - CLTX (1):

1. A packet data sending apparatus for sending a plurality of packets at each packet sending timing, comprising: sent data amount storage means for storing an amount of packet data sent from a preset time to a preceding packet sending timing; calculating means for adding a plurality of amounts of packet data which may possibly be sent at a present packet sending timing, to the amount of packet data stored in said sent data amount storage means thereby to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates; selecting means for selecting a data transmission rate closest to a desired data transmission rate from the data transmission rates calculated by said calculating means; and packet sending means for sending a number of packets corresponding to the amount of packet data commensurate with the data transmission rate selected by said selecting means.

Claims Text - CLTX (3):

3. A packet data sending apparatus for sending a plurality of packets at each packet sending timing, comprising: sent data amount storage means for storing an amount of packet data sent from a preset time to a preceding packet sending timing; calculating means for adding a plurality of amounts of packet data which may possibly be sent at a present packet sending timing, to the amount of packet data stored in said sent data amount storage means thereby to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates; selecting means for selecting a higher data transmission rate greater than and closest to a desired data transmission rate and a lower data transmission rate smaller than and closest to said desired data transmission rate, from the data transmission rates calculated by said calculating means; and packet sending means for sending a number of packets corresponding to the amount of packet data commensurate with one of the higher and lower data transmission rates selected by said selecting means, which is opposite to the one selected at said preceding packet sending timing.

Claims Text - CLTX (5):

5. A packet data sending apparatus for sending a plurality of packets each containing a constant amount of data at each packet sending timing, comprising: sent packet number storage means for storing a number of packets sent from a preset time to a preceding packet sending timing; calculating means for adding a plurality of numbers of packets which may possibly be sent at a present packet sending timing, to the number of packets stored in said sent packet number storage means thereby to obtain a plurality of total numbers of packets, multiplying the total numbers of packets by the amount of data contained in each packet to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates; selecting means for selecting a data transmission rate closest to a desired data transmission rate from the data transmission rates calculated by said calculating means; and packet sending means for sending a number of packets commensurate with the data transmission rate selected by said selecting means.

Claims Text - CLTX (7):

7. A packet data sending apparatus for sending a plurality of packets each containing a constant amount of data at each packet sending timing, comprising: sent packet number storage means for storing a number of packets sent from a preset time to a preceding packet sending timing; calculating means for adding a plurality of numbers of packets which may possibly be sent at a present packet sending timing, to the number of packets stored in said sent packet number storage means thereby to obtain a plurality of total numbers of packets, multiplying the total numbers of packets by the amount of data contained in each packet to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates; selecting means for selecting a higher data transmission rate greater than and closest to a desired data transmission rate and a lower data transmission rate smaller than and closest to said desired data transmission rate, from the data transmission rates calculated by said calculating means; and packet sending means for sending a number of packets commensurate with one of the higher and lower data transmission rates selected by said selecting means, which is opposite to the one selected at said preceding packet sending timing.

Claims Text - CLTX (9):

9. A packet data sending apparatus for sending a plurality of packets at each packet sending timing, comprising: first calculating means for adding a plurality of amounts of packet data which may possibly be sent at a present packet sending timing, to an amount of packet data sent from a preset time to a preceding packet sending

timing thereby to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by a time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates; first selecting means for selecting a data transmission rate closest to a desired data transmission rate from the data transmission rates calculated by said first calculating means; first packet sending means for sending a number of packets corresponding to the amount of packet data commensurate with the data transmission rate selected by said first selecting means; second selecting means for selecting a higher data transmission rate greater than and closest to said desired data transmission rate and a lower data transmission rate smaller than and closest to said desired data transmission rate, from the data transmission rates calculated by said first calculating means; second packet sending means for sending a number of packets corresponding to the amount of packet data commensurate with one of the higher and lower data transmission rates selected by said second selecting means, which is opposite to the one selected at said preceding packet sending timing; second calculating means for adding a plurality of numbers of packets which may possibly be sent at the present packet sending timing, to a number of packets sent from the preset time to the preceding packet sending timing thereby to obtain a plurality of total numbers of packets, multiplying the total numbers of packets by the amount of data contained in each packet to obtain a plurality of total amounts of packet data, and dividing the total amounts of packet data by the time period from the preset time to the present packet sending timing thereby to calculate a plurality of data transmission rates; third selecting means for selecting a data transmission rate closest to the desired data transmission rate from the data transmission rates calculated by said second calculating means; third packet sending means for sending a number of packets commensurate with the data transmission rate selected by said third selecting means; fourth selecting means for selecting a higher data transmission rate greater than and closest to said desired data transmission rate and a lower data transmission rate smaller than and closest to said desired data transmission rate, from the data transmission rates calculated by said second calculating means; fourth packet sending means for sending a number of packets corresponding to the amount of packet data commensurate with one of the higher and lower data transmission rates selected by said fourth selecting means, which is opposite to the one selected at said preceding packet sending timing; and fifth selecting means for selecting one of said first and said second calculating means, one of said first through fourth selecting means, and one of said first through fourth packet sending means, depending on the nature of packet data to be transmitted.

Claims Text - CLTX (10):

10. A packet data sending apparatus according to claim 9, wherein said fifth selecting means comprises means for selecting said first calculating means, said first selecting means, and said first packet sending means if the packet data to be transmitted have different amounts of data for respective packets and need an accurate packet data transmission rate rather than high-speed packet data transmission processing.

Claims Text - CLTX (11):

11. A packet data sending apparatus according to claim 9, wherein said fifth selecting means comprises means for selecting said first calculating means, said second selecting means, and said second packet sending means if the packet data to be transmitted have different amounts of data for respective packets and need high-speed packet data transmission processing rather than an accurate packet data transmission rate.

Claims Text - CLTX (12):

12. A packet data sending apparatus according to claim 9, wherein said fifth selecting means comprises means for selecting said second calculating means, said third selecting means, and said third packet sending means if the packet data to be transmitted have equal amounts of data for respective packets and need an accurate packet data transmission rate rather than high-speed packet data transmission processing.

Claims Text - CLTX (13):

13. A packet data sending apparatus according to claim 9, wherein said fifth selecting means comprises means for selecting said second calculating means, said fourth selecting means, and said fourth packet sending means if the packet data to be transmitted have equal amounts of data for respective packets and need high-speed packet data transmission processing rather than an accurate packet data transmission rate.